WHAT IS CLAIMED IS:

1. A method for multi-band, bidirectional data communication over a non-ideal channel using a single CAP/QAM carrier per band, comprising:

defining a total target bit rate for said multiple bands;

defining a margin requirement for each of said multiple bands;

evaluating a response characteristic of each of said multiple bands; and

defining a combination of spectral allocation and constellation size at which bit rate and/or margin is enhanced in accordance with said response characteristic.

2. The method of claim 1 further comprising the steps of defining a plurality of spectral allocations for each of said multiple bands wherein said response characteristic is evaluated with respect to said plurality of spectral allocations.

3. The method of claim 2 further comprising the step of determining a maximum constellation size for each of said plurality of spectral allocations in accordance with said response characteristic.

4. The method of claim 3 further comprising the step of varying said maximum constellation size to increase a signal-noise-ratio margin without falling below a total target bit rate for said multiple bands.

5. A method for multi-band, bidirectional data communication over a non-ideal channel using a single CAP/QAM carrier per band, comprising:

evaluating a response characteristic of each of said multiple bands with respect to a parametric set;

varying said parametric set by varying a constellation vector to increase a signal-noise-ratio margin without falling below a total target bit rate for said multiple bands;

re-evaluating the response characteristic of each of the multiple bands with respect to said varied parametric set; and

defining an optimal parametric set for which the response characteristic allows optimization of at least one of said constellation vector and signal-noise-ratio margin.

6. The method according to claim 5, wherein the step of varying the constellation size further comprises:

varying the constellation size while maintaining a substantially constant spectral allocation; and

repeating the constellation size varying step at a plurality of different discrete spectral allocations.

7. The method according to claim 5, wherein the step of evaluating a response characteristic of each of said multiple bands with respect to a parametric set comprises evaluating signal-to-noise-ratio.

8. The method according to claim 5 further comprising the step of evaluating said response characteristic with respect to said optimal parametric set.

9. The method according to claim 8 further comprising the step of commencing bidirectional communication with said optimal parametric set if said response characteristic complies with a predetermined threshold.

10. The method according to claim 8 further comprising the step of adjusting said constellation vector in accordance with said response characteristic.

11. A method for multi-band, bidirectional data communication over a non-ideal transmission channel using a single CAP/QAM carrier per band, comprising:

defining a spectral allocation for each of said multiple bands;

evaluating a response characteristic of each of said multiple bands with respect to said plurality of spectral allocations;

determining a maximum constellation size for each of said plurality of spectral allocations in accordance with said response characteristic;

determining total bit rate delivered for each of said plurality of spectral allocations and maximum constellation sizes;

varying said maximum constellation sizes to increase signal-noise-ratio margin without falling below a total target bit rate;

defining an optimal spectral allocation and constellation size in accordance with at least one of said constellation size and signal-noise-ratio margin.

12. A method for multi-band, bidirectional data communication over a non-ideal transmission channel using a single CAP/QAM carrier per band, comprising:

defining a plurality of spectral allocations for each of said multiple bands;

evaluating a response characteristic of each of said multiple bands with respect to said plurality of spectral allocations;

determining a maximum constellation size for each of said plurality of spectral allocations in accordance with said response characteristic;

determining total bit rate delivered for each of said plurality of spectral allocations and maximum constellation sizes;

defining an optimal spectral allocation and constellation size at which bit rate and/or noise margin is enhanced in accordance with said total bit rate.

13. The method according to claim 12 wherein the step of defining an optimal spectral allocation and constellation size comprises:

defining a first subset containing spectral allocation and constellation size combinations for which the total bit rate is equal to or greater than a target bit rate;

varying said plurality of constellation sizes within said first subset to increase said noise margin without falling below a total target bit rate for said multiple bands; and

defining said optimum spectral allocation and constellation size in accordance with said increased noise margin.

14. The method according to claim 13 wherein the step of defining said optimum spectral allocation and constellation size in accordance with said increased noise margin comprises defining optimum spectral allocation and constellation size in accordance with largest minimum noise margin.

15. The method according to claim 12 wherein the step of defining an optimal spectral allocation and constellation size comprises:

defining a first subset containing spectral allocation and constellation size combinations that provide a total bit rate that is less than a target bit rate;

identifying spectral allocation and constellation size combinations within said first subset that provide largest total bit rate; and

defining said optimum spectral allocation and constellation size in accordance with said noise margin.

16. The method according to claim 12 wherein the step of defining an optimal spectral allocation and constellation size comprises:

defining a first subset containing spectral allocation and constellation size combinations for which the total bit rate is equal to or greater than a target bit rate;

varying said plurality of constellation sizes within said first subset to produce bit rate that is as large as possible but that is also less than or equal to the target bit rate;

defining said optimum spectral allocation and constellation size in accordance with said noise margin.

17. The method according to claim 16 wherein the step of defining said optimum spectral allocation and constellation size in accordance with said noise margin comprises defining optimum spectral allocation and constellation size in accordance with largest minimum noise margin.

18. A method for enhancing a bit rate and/or margin at which communication is performed over multiple bands within a communication link, the method comprising the steps of:

defining a plurality of spectral allocations for each band within said link, wherein each spectral allocation relates to a single QAM channel; and

defining an optimum combination of one of the defined spectral allocations and a constellation size at which total bit

rate and/or margin across said multiple bands is enhanced, wherein each constellation size relates to a single QAM channel.

19. The method according to claim 18 further comprising the steps of:

evaluating a response characteristic of said multiple bands with respect to said plurality of spectral allocations;

determining a maximum constellation size for each of said plurality of spectral allocations in accordance with said response characteristic;

determining total bit rate delivered for each of said plurality of spectral allocations and maximum constellation sizes; and

wherein said optimum combination of spectral allocation and constellation size is defined in accordance with said total bit rate.

20. A transceiver for bi-directional communication over a multi-band communication link, comprising

a transmit spectrum control circuit for varying a spectral allocation with which encoding is performed on said multiple bands;

a transmit constellation size control circuit for varying a constellation size with which encoding is performed on said multiple bands ; and

wherein the transmit spectrum control and transmit constellation size control circuits cooperate to define a combination of spectral allocation and constellation size at which total bit rate and/or margin is enhanced over said multiple bands.

21. The transceiver as recited in claim 20, wherein the transmit spectrum control circuit is configured to sweep a symbol

rate and center frequency of at least one of a downstream channel and an upstream channel in a substantially continuous manner.

22. The transceiver as recited in claim 20, wherein the transmit spectrum control and transmit constellation size control circuits are configured to cooperate to vary the constellation size while maintaining a substantially constant spectral allocation.

23. The transceiver as recited in claim 20, further comprising a receive spectrum control circuit for varying a spectral allocation with which decoding is performed on said multiple bands.

24. The transceiver as recited in claim 20, further comprising a receive constellation size control circuit for varying a constellation size with which decoding is performed on said multiple bands.